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## Physics 342, Homework 4

Remember,  $x$  is dummy variable. You may need to write the functions you are minimizing as dependent on  $z$ ,  $\theta$ , etc. For example, in problem 2 you are minimizing a  $z'(\theta)$ . The goal is to solve for  $z$ .

1: (medium) - Minimize  $\int_{x_1, y_1}^{x_2, y_2} ds$  Where  $ds = \sqrt{dx^2 + dy^2}$ . This is longer if you fail to notice what  $\frac{df}{dx} = 0$  implies. Use equation 6.18 to find the solution. The solution is that  $y = Ax + B$ . Essentially you are showing that the shortest path between two points in two dimensions is a straight line.

2: (medium) - Minimize the path along the surface of a circular cylinder of radius  $R$ . Essentially, minimize  $\sqrt{dx^2 + dy^2 + dz^2}$  where  $R$  is constant. remember  $x = R\cos(\theta)$  and  $y = R\sin(\theta)$ . Write the function that you are minimizing as  $F(z(\theta))$ . Show that your answer describes a helix. Use equation 6.18 again.